

**NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION**

**FOR
EARTH DAMS
(378-A)**

General

Construction operations shall be carried out in such a manner and sequence that erosion and air and water pollution will be minimized and held within legal limits. **A land disturbance permit from the Missouri Department of Natural Resources may be needed if the disturbed area is greater than one (1) acre in size.**

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used.

The contractor is responsible for having all utilities located at the site according to Missouri state laws prior to beginning work.

Foundation preparation

The foundation area shall be cleared of trees, logs, stumps, roots, brush, boulders, sod, and rubbish. A minimum of 3 inches of topsoil and sod shall be stripped from foundation area. The topsoil and sod are to be stockpiled.

Existing stream channels crossing the foundation area shall be sloped 2:1 or flatter and deepened and widened as necessary to remove unconsolidated sediments, stumps, roots, and other objectionable material and to accommodate compaction equipment.

After stripping, the foundation area will be prepared to assure bonding with the fill by removing loose dry material, scarifying, disking, adjusting moisture, and compacting as necessary.

Cutoff trench

The minimum depth shown on the drawing is an estimate. Final depth of cutoff trench shall be determined by observation. Side slopes of cutoff trench shall be 1 1/2:1 or flatter, as needed to be stable. Sand, gravel, and other water conducting materials shall be removed to prevent leakage under the dam.

When rock or other hard layers are encountered, a bulldozer mounted single tooth ripper shall be used to loosen all weathered material. Stair-step rock or hard ledges will require handwork to remove all loose materials and hand backfill with clay before machine backfill is started.

In some cases, it will be necessary to thoroughly clean the bottom of rock core trenches to ensure good bond and prevent leakage.

Fill placement

The material placed in the fill shall be free of detrimental amounts of sod, roots, frozen soil, stones over 6 inches in diameter (except for rock fills), and other objectionable material. To the extent they are suitable, excavated materials are to be used as fill material. The distribution and gradation of materials shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use material of varying texture and gradation, the more plastic material shall be placed in the center and upstream portions of the fill. Foundation areas and cutoff trenches shall be kept free of standing water when fill is being placed on them.

The placing and spreading of the fill shall be started at the lowest point of the foundation

and the fill shall be brought up in approximately horizontal layers not to exceed 9 inches in thickness. Each layer shall be spread, processed, and shall be compacted by one of the following methods, as specified on the drawings:

Dozer - Complete coverage by tread or track of hauling or spreading equipment. Each lift shall not exceed 5 inches in thickness.

Roller - two passes of standard tamping type roller over the entire area to be compacted. Complete coverage by the treads of loaded hauling equipment is considered equivalent to two (2) passes of tamping roller. Each lift shall not exceed 9 inches in thickness.

The tamping-type roller shall have tampers or feet projecting not less than six (6) inches from the surface of the drum and shall have a minimum static load on each tamper of 250 pounds per square inch of tamping area. Tamping rollers with minimum static load on each tamper of 125 pounds per square inch of tamping area may be used if the number of passes is increased to four (4) or the thickness of lifts is reduced to four (4) inches. (Sheepsfoot or wedgefoot drum rollers are considered tamping rollers.)

An opening in the fill for drainage during construction is permitted. Care must be taken when the fill closure is made to assure proper compaction and bond of the fill material to the existing fill. The opening shall have a bottom

width wide enough to allow equipment to work on a horizontal plane. As the drainage opening is filled, the side slopes of the existing fill shall be excavated until solid material is uncovered and good bond can be attained.

Moisture control

The minimum moisture content of the fill material and foundation shall be such that, when kneaded in the hand, the fill material will form a ball which does not readily separate. The maximum moisture content is when conditions are too wet for efficient use of the hauling and compaction equipment.

Borrow areas

All borrow areas outside the pool area shall be graded and left so they are well drained, protected from erosion, and may be seeded. Borrow areas inside the pool area shall have side slopes of 2:1 or flatter.

Placement of topsoil

Available topsoil should be placed on the auxiliary spillway, the downstream slope, top, exposed surface of the upstream slope of the dam, and any other disturbed areas.

Vegetation

Refer to JS-AGRON-25 for seeding and mulching recommendations or equivalent.

Additional Details: _____

NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION
FOR
PIPE SPILLWAY
(378-B)

Materials

Materials and fabrication shall be as specified on the drawings.

Corrugated metal pipe shall conform to the requirements of ASTM A760, A762, A885, B745, or B790 as appropriate. Plastic pipes through a dam shall be polyvinyl chloride pipe, PVC 1120 or 1220 conforming to ASTM D1785, ASTM D2241, or ANSI/AWWA C900. The SDR PVC plastic sewer pipe shall conform to ASTM D3034. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 or ASTM A674. Welded steel pipe shall meet tolerance requirements of ASTM A53 or equivalent specifications. Welded steel pipe shall be new, new reject, or high quality used pipe. Anti-seep collars shall be of materials compatible with the pipe.

Installation

The pipe conduit shall be placed on a firm foundation to the lines and grades shown on the drawings. Installation shall be conducted in a skillful and workmanlike manner.

Anti-seep collars are to be installed at locations shown on the drawings with watertight connections. When the bottom half is placed in a trench, special backfill and compaction will be required to prevent leakage.

Where no cradle is provided under the pipe, the foundation shall be covered with one (1) inch of loose, friable ML or CL soil material (Unified Soil Classification System) immediately prior to placing the pipe. This material should be saturated before additional backfill is placed.

Selected backfill of friable ML or CL material shall be placed around structures, pipe conduits, and anti-seep collars at approximately the same rate on all sides to prevent unequal pressures. Water packing is permitted for smooth steel conduits 36 inches or less in diameter when total fill over the conduit will be ten (10) feet or less. Rubber tire, hand, or manually directed power tamper will be used on backfill around all conduits or structures where water packing is not permitted or used. Extreme caution must be exercised in backfill and compaction around structures or conduits to prevent damage, movement or deflection. Compaction on the bottom half of conduits must be firm to fill all voids and supply lateral support but not to the point where uplift pressure is exerted. Fill adjacent to concrete shall not be placed until the concrete is strong enough to support the load. Adequate moisture must be maintained in all backfill material.

The minimum moisture content of fill material and foundation shall be such that when kneaded in the hand, the fill material will form a ball which does not readily separate. The maximum moisture content is when conditions are too wet for efficient use of the hauling and compaction equipment.

Equipment shall not be operated over any structure or conduit until there is sufficient backfill to prevent damage.

Additional Details: _____

NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION
FOR
WATER SUPPLY SYSTEM FOR EARTH DAMS
(378-C)

Materials

Materials and fabrication shall be as specified on the drawings and as recommended by the manufacturer of the tank. The inside diameter of the pipe shall be as shown on drawings. All plumbing components shall be compatible with the tank and pipe used.

Plastic pipe 2 inches or less in diameter meeting ASTM specifications D-1785, D-2239, D-2241 or AWWA C-901 may be used. Plastic pipe over 2 inches in diameter shall be Polyvinyl Chloride (PVC) 1120 or 1220 conforming to ASTM D-1785 or D-2241. The ASTM or AWWA designation shall be stamped on the pipe. Steel pipe shall meet ASTM specification A-53 or equivalent. Other pipe meeting MO-NRCS Pipeline Standard 516 is acceptable.

Tanks shall be durable enough to withstand forces exerted by the water, soil, and livestock and shall have a minimum design life of 10 years. Crushed rock or gravel shall be composed of hard durable rock. Poured concrete for pad or tank shall conform to Construction Specification 750, Reinforced Concrete.

Pipe installation

The pipe trench within the dam or its foundation shall be excavated with side slopes of 1.5:1 or flatter. The pipe shall be placed on a firm foundation to the lines and grades shown on the drawings. All parts of the water system shall be installed and connected according to the manufacturer's

recommendations. All joints shall be watertight.

Backfill for plastic pipe shall be free of rocks and other sharp-edged materials. Backfill material shall have adequate moisture for compaction. Compaction may be achieved by hand, rubber tire, or manually directed power tampers. Deformation or displacement of pipe must not occur during backfilling. Plastic pipe may be filled with water and capped to prevent collapsing. Equipment shall not be operated over the pipe until there is sufficient backfill to prevent damage.

The outlet pipe should be buried below frost line or otherwise protected from freezing.

Testing

Before backfilling, the pipe shall be filled with water and tested at design working head or a minimum head of 10 feet whichever is greater. All leaks shall be repaired and the test repeated before backfilling.

Pad and tank installation

The pad and the area surrounding the tank should be graded to allow surface water to drain away from the tank. Tanks shall be located away from dam or critical erosion areas whenever possible.

Refer to the drawings and Missouri Construction Specification Water Facility (614) for pad and tank requirements.

Additional Details: _____
